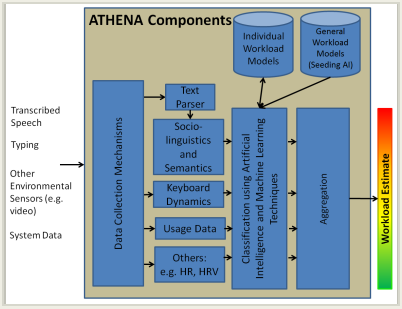
ATHENA - Appraisal of Task Health and Effort through Non-Intrusive Assessments, Phase I

Completed Technology Project (2015 - 2015)

Project Introduction

Based on a series of prior and ongoing research projects funded by NASA and the US Air Force (US AF), we have demonstrated viable methods to achieve accurate workload measures (70-100% accuracy) for an Unmanned Aerial Vehicle (UAV) work domain using linguistics and keystroke dynamics. We believe these methods can be reconfigured to use for spaceflight operations. These completely unobtrusive measures of cognitive load can be part of an overall workload assessment assay and are compatible with both team and individually performed tasks. Within Phase I, we will conduct an extensive literature review of the current state of the art in automated detectors, focusing on unobtrusive methods that can detect dimensions proven scientifically to predict workload. This review will reveal evidence-based features that show the most promise as both behavioral indicators of workload and as objective measurements that are amendable to machine learning and statistical techniques. The results of this review will serve as a risk reduction exercise to evaluate and down-select a set of workload detection methods that warrant further investigation. We will then use the set of candidate metrics, along with our own prior work with semantic analysis and keystroke dynamics to design machine learning algorithms, ultimately producing a workload sensor tailored for use with long duration mission relevant tasks. Phase I will include an exploratory investigation of a candidate measures, initial sensor designs, and produce experimental plans and IRB protocols for the overall system validation using a combination of data gathered from laboratory settings and ground-based analogs such as the Human Exploration Research Analog (HERA) at JSC, the UTMB Bedrest facility, and the Hawaii Space Exploration Analog Simulation (HISEAS). Phase II will focus on engineering efforts to implement the sensor algorithms, the support tools for the experiment, conducting the validation study, and data analysis.



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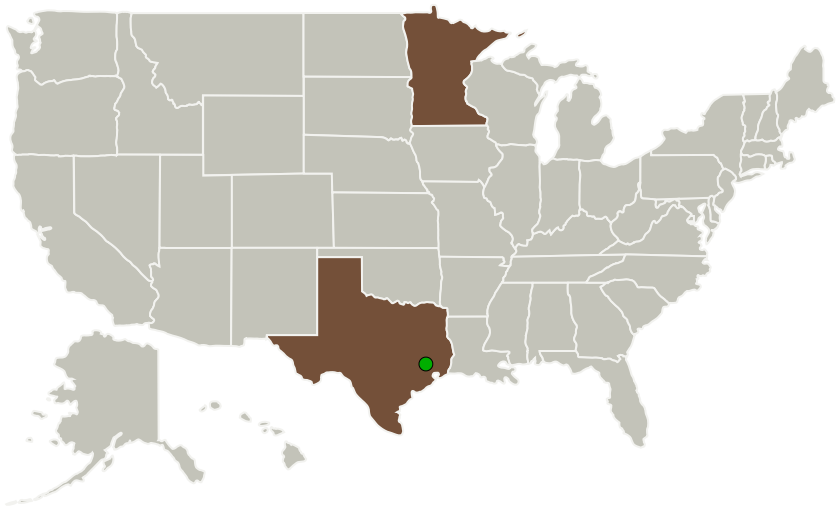
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
SIFT, LLC	Lead Organization	Industry	Minneapolis, Minnesota
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Minnesota	Texas

Project Transitions

June 2015: Project Start

December 2015: Closed out

Closeout Summary: ATHENA - Appraisal of Task Health and Effort through Non-Intrusive Assessments, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/138828)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

SIFT, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

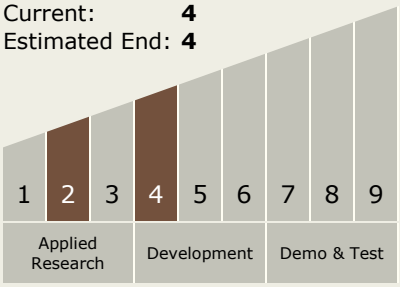
Carlos Torrez

Principal Investigator:

Peggy Wu

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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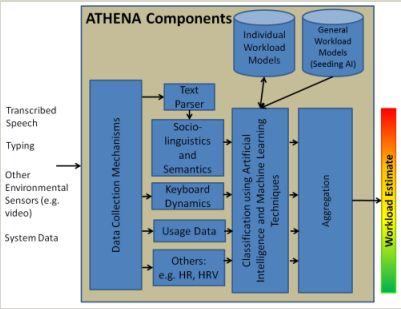
Images



Briefing Chart Image
ATHENA - Appraisal of Task Health and Effort through Non-Intrusive Assessments, Phase I *(https://techport.nasa.gov/image/131250)*

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.6 Human Systems Integration
    - TX06.6.1 Human Factors Engineering

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System